

CLAIMS

1. A continuous steel casting method, wherein while a vibrating magnetic field is generated with an arrangement of at least three electromagnets disposed along a longitudinal direction of a mold for continuous casting, peak positions of the vibrating magnetic field are shifted along the longitudinal direction.
2. The continuous steel casting method according to Claim 1, wherein the arrangement of at least three electromagnets has a part where coil phases of three adjacent electromagnets are in the order of  $n$ ,  $2n$ , and  $n$  or  $n$ ,  $3n$ , and  $2n$ .
3. The continuous steel casting method according to Claim 1 or 2, wherein a direct-current magnetic field is superimposed on the vibrating magnetic field in a thickness direction of a cast slab.
4. The continuous steel casting method according to any one of Claim 1, 2, and 3, wherein the melting points of inclusions in unsolidified molten steel in the mold is reduced so that a nozzle from which the molten steel is fed is prevented from being clogged, whereby continuous casting is performed without blowing an inert gas from the nozzle.
5. The continuous steel casting method according to Claim 4, wherein the molten steel is an ultra low carbon steel

deoxidized by Ti having a composition containing: C  $\leq$  0.020% by mass, Si  $\leq$  0.2% by mass, Mn  $\leq$  1.0% by mass, S  $\leq$  0.050% by mass, and Ti  $\geq$  0.010% by mass, and satisfying the relationship Al  $\leq$  Ti/5 on a content basis of percent by mass.

6. The continuous steel casting method according to Claim 5, wherein the molten steel is decarburized with a vacuum degassing apparatus, subsequently deoxidized with a Ti-containing alloy, and then an alloy for controlling the composition of inclusions is added to the molten steel, wherein the alloy contains at least one metal selected from among 10% by mass or more of Ca and 5% by mass or more of rare earth metals and at least one element selected from the group consisting of Fe, Al, Si, and Ti, and wherein the resulting oxide in molten steel contains 10% to 50% by mass of at least one selected from the groups consisting of CaO and REM oxides, 90% by mass or less of Ti oxide, and 70% by mass or less of Al<sub>2</sub>O<sub>3</sub>.

7. The continuous steel casting method according to Claim 6, wherein the molten steel after the decarburization is pre-deoxidized with Al, Si, or Mn so that the concentration of dissolved oxygen in the molten steel is 200 ppm or less, before the deoxidation with the Ti-containing alloy.

8. The continuous steel casting method according to any one of Claims 1, 2, 3, 4, 5, 6, and 7, wherein the maximum value of Lorentz forces induced by the vibrating magnetic

field is in the range of 5,000 N/m<sup>3</sup> or more and 13,000 N/m<sup>3</sup> or less.

9. The continuous steel casting method according to any one of Claims 1, 2, 3, 4, 5, 6, 7, and 8, wherein the flow rate  $V$  (m/s) of the unsolidified molten steel in the mold for continuous casting and the maximum value  $F_{max}$  (N/m<sup>3</sup>) of Lorentz forces induced by the vibrating magnetic field are adjusted so that  $V \times F_{max}$  is 3,000 N/(s·m<sup>2</sup>) or more.